Tales as tools: The power of storytelling strategy in the Mathematics classroom

Lawani, A.O.
Department of Mathematics, Tai Solarin University of Education, Ogun State, Nigeria
Corresponding author: lawaniao@tasued.edu.ng

ABSTRACT

Disseminating tales and acquainting opinions are all attributes of a good story; some of its benefits are interest improvement, retention enhancement and nervousness reduction. This study investigated the power of storytelling strategy in Mathematics classrooms. A pre-test, post-test, control group quasi-experimental research design was employed. One hundred and fifty (150) Junior Secondary School two (JSS 2) students from two purposively selected secondary schools in Ijebu-Ode Local Government Area of Ogun State constituted the sample for the study. Three instruments were used in the study. Three hypotheses were tested and data collected were subjected to Analysis of Covariance (ANCOVA) at 0.05 level of significance. Results revealed that storytelling strategy was effective in enhancing students' achievement in Mathematics $F_{(1,145)} = 52.502$; $P < 0.05$; $n^2 = 0.266$). Meanwhile, there was no significant main effect of gender on students' academic achievement in Mathematics ($F_{(1,145)} = 1.893$, $P = 0.171$) and there was no significant interaction effect of storytelling strategy and gender on students' academic achievement in Mathematics $F_{(1,145)} = 2.562$; $P = 0.112$). The story concluded that storytelling is a way to teach Mathematics to a class of Junior Secondary School students. It was recommended that teachers could incorporate storytelling strategy into Mathematics classrooms in order to enhance students' academic achievement.

Keywords: storytelling strategy, Mathematics classroom, achievement, gender.

Introduction

It is required of teachers to have good content knowledge of the subject they specialize in; however, having only that is not sufficient. The ability to communicate it effectively to students is perhaps more important. Beginning the Mathematics lesson in a skillful manner by the teacher, arresting the attention of the learners and sustaining it makes the achievement of the lesson objectives possible through expertise displayed in the way instruction is passed down by the tutor. Most tutors do not bring any expertise to classes and the consequence is predictable, frustration. Learners do not attain the set goals, hatred and fear for the subject become the norm and this adversely affects their achievement daily in the classroom, end of term evaluation and of course in external examinations grades. Teachers and other stakeholders are alarmed about the challenge and solutions are being sought.

In most Mathematics classrooms, instructions are handed down to learners through the lecture method, memorization of facts and concepts and other methods of imparting knowledge but not story telling method. Story telling had not been thought appropriate especially in Mathematics lessons. A story is a compact answer that has a narrative unit that can fix the affective meaning of the elements that compose it. It is a unit of some particular kind; it has a beginning that sets up a conflict or expectation, a middle that complicates it, and an end that resolves it. Chapman (2008) disclosed that storytelling is a way of specifying experience, a mode of thought, a way of making sense of human actions or a way of knowing. Hilder (2005) describes stories as a kind of thinking tool due to their "power to fix affective responses to the messages".

Words that could be used as synonyms of story are narrative, account, yarn, legend, chronicle etc. Stories that could be used in Mathematics classes that are typically oral and ephemeral include anecdote, rumor, hear-say, gossip and joke. Other forms of story that are originally oral and to some extent enduring either through being told and retold, or through being written down such as fable, parable, myth and legend; stories in written literature which include short story, novella, epic, tragedy and comedy. Storytelling strategy involves utilizing relevant and fascinating stories that make the points of

discussion become clearer. It is commonly used at the primary and secondary levels to initiate the interest of students in the topic being introduced. Storytelling could be used at any stage in Mathematics lessons to reinforce the point of discussion, it could be used at the beginning of the lesson to serve the purpose of introducing the topic or used at the end to summarize or lay emphasis on an important point. The characteristics of storytelling include the following according to National Storytelling Network (2016):

1. Storytelling is an interaction between a storyteller and one or more listeners. It emerges from the interaction and co-operative, coordinated efforts of teller and audience. The interactive nature of storytelling partially account for its immediately and impact. At its best, storytelling can directly and tightly connect the teller and audience;

2. Storytelling uses words i.e. language, spoken language or a manual language. The use of language distinguishes storytelling from most forms of dance and mime;

3. Storytelling uses vocalization. This distinguishes it from writing and text based computer interactions;

4. Storytelling presents a story, (a narrative);

5. Storytelling encourages the active imagination of the listeners.

In storytelling, the listener imagines the story. The storytelling listener's role is to actively create the vivid, multi-sensory images, actions, characters and events. i.e. the reality of the story in his or her mind based on the narration of the teller and on the listener's own past experiences, beliefs and understandings. The completed story happens in the mind of the listeners. The listener becomes therefore, a co-creator of the story as experienced.

Sowonya (2015) highlighted the under listed as elements of effective stories in Mathematics classrooms: it must be context specific, the story must reflect the area being taught in class; it must be level appropriate, story told in the class must be appropriate to the age level as well as the experience level of the students only then will the audience appreciate it and internalize the essence of it; it must be told by respected role models, it matters a lot as to who is narrating the story. If it is narrated by someone who is admired and respected, the chances are that the learning will be better internalized. It has drama, if a story has more drama, the chances are that the listeners (students) will remember the story much better compared to a very simple story line; high learning value, at the end of the story, the person remembers the essence of it which will always remain with the recipients. Carys (2017) submitted that the act of storytelling appeals to different learning preferences and personalities ensuring that from the shyest to the most active of students, everyone has a chance to participate in a way that they can enjoy. This ranges from listening quietly to taking part as an actor.

Good stories stir our emotions and offer us opportunities to use our mind in fresh experimental ways, to flex our emotions, to enjoy, to learn and to add depth to our days (Gadanidis & Hoogland, 2002). Storytelling provides opportunities to solve puzzles in artistic way where the storyteller creates situations for its audience to experience the pleasure of surprise and insight in Mathematics (Gadanidis, 2012). Zepeda (2014) stated that it helps the knowledge, wisdom, and value shared, connects previous experiences and enhances memory. Glonek & King, 2014; Hilder 2005) also affirmed that learners retain more information when it is presented in a narrative style.Toor & Mgombelo (2015) wrapped it up that storytelling humanizes Mathematics, where students are able to relate to Mathematics at a personal level.

Modi (2012) summarized the benefits of storytelling in Mathematics classroom to include the following:

- Create a safe-learning environment where a learner might openly appreciate, understand and enjoy Mathematics;
- Makes learning more accessible with students being more engaged with their learning;

- Power to engage students' emotions, connecting their imaginations in material of curriculum;
- Creates an environment of imagination, emotion, and thinking, which makes Mathematics more enjoyable and more memorable for its participants;
- Provides ground for participants to engage in a mathematical activity, which provides them with the opportunities to think, explore, and understand mathematical concepts and ideas;
- Creates a comfortable and supportive atmosphere in the classroom, and builds a bond between the teacher and her learners.

Storytelling allows teachers to enter the lives of students as they're forming a sense of self- identity. It promotes a sense of community and belonging, enables relationship networking, allows participants to engage in sense-making, helps develop empathy and self-confidence, and facilitates learning (Zepeda, 2014). Both male and female students learn better in a relaxed and motivating environment especially in a classroom. Lawani 2021; Lawani 2021; and Lawani et al 2016 all established that gender difference does not influence students' academic performance in Mathematics. This is because they need to understand spoken and written expressions which involve mathematical concepts and number relationship.

Kariuki and Humphrey (2006) found a significant difference between the academic achievement of those taught using drama and the traditional instruction, they concluded that drama can be an effective teaching tool but may be more beneficial over a longer time to students whose learning style best appeals to such instruction. Ozel and Ufektepe (2002) maintained that using storytelling strategy to teach Mathematics can increase students' interest and attentiveness during lessons these can in turn facilitate better internalization of concepts buttressing it. Hung, et al (2012) discovered that storytelling is effective in enhancing the students' achievement.

Previous studies had researched different strategies that could improve the achievement of students in Mathematics but the use of storytelling is not common in Mathematics classrooms in Ijebu Ode Local Government Area of Ogun State. There is, therefore, the need to employ a better and interesting strategy of teaching mathematical concepts so as to improve students' achievement in Mathematics in the study area and especially in Junior Secondary School Mathematics classrooms. This necessitated the investigation of the power of storytelling strategy in JSS Mathematics classroom. The study also investigated how gender interacts with storytelling to influence students' academic achievement in Mathematics in the study area.

STATEMENT OF HYPOTHESES

The following hypotheses were tested:

i. There is no significant main effect of storytelling strategy on students' academic achievement in Mathematics.
ii. There is no significant main effect of gender on students academic achievement in Mathematics.
iii. There is no significant interaction effect of storytelling strategy and gender on students' academic achievement in Mathematics.

METHODOLOGY

The study employed a pre-test, post-test, control group quasi-experimental research design. The population for this study comprised of the second year Junior Secondary School students in public secondary schools in Ijebu-Ode Local Government Area of Ogun State. Junior Secondary School 2 students were chosen because they are considered to be matured and stable emotionally. The students in this category are between the ages of 9 and 13, more so they are not preparing for any national examination. The purposive sampling technique, a type of non-probability sampling, was used to select the Junior Secondary Schools used. Two schools were randomly selected. Intact classes were used and in all, a total of 150 students participated in the study.

Three instruments were used in the study, two procedural instruments and one main instrument. The procedural instruments were used to instruct participants in the experimental and control groups while the main instrument was the Mathematics Achievement Test (MAT). MAT measured students' achievement. The same instrument was used for the pre-test and post-test. The maximum score obtainable in the MAT was 40 and the minimum score was 0. The topics taught were Pythagoras rule, trigonometry ratio, angles of elevation and depression.

The study lasted six weeks. The first and last weeks were used for the pre-test and post-test respectively while the main treatment lasted four weeks. Pre-test was administered to determine if any statistically significant difference existed between the two groups at the beginning of the study. During the treatment, the duration of lessons was 40 minutes. ANCOVA was used in analyzing the data collected at 0.05 level of significance.

RESULTS

Hypothesis one

There is no significant main effect of storytelling strategy on students' academic achievement in Mathematics.

Table 1: Summary of Analysis of Covariance of Students' Achievement Scores According to Instructional strategy and Gender

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3172.444[a]	4	793.111	25.772	.000	.416
Intercept	6036.912	1	6036.912	196.165	.000	.575
Pre	601.249	1	601.249	19.537	.000	.119
Treatments	1615.727	1	1615.727	52.502	.000	.266
Gender	58.247	1	58.247	1.893	.171	.013
treatments * gender	78.840	1	78.840	2.562	.112	.017
Error	4462.329	145	30.775			
Total	140960.000	150				
Corrected Total	7634.773	149				

a. R Squared = .416 (Adjusted R Squared = .399)

Table 1 shows that there is significant treatment effect on participants' academic achievement in Mathematics $F_{(1,145)} = 52.502; P < 0.05; n^2 = 0.266$)

Hypothesis two

There is no significant main effect of gender on students' academic achievement in Mathematics.

The results of the main effect of gender in the table 1 shows that there is no significant main effect of gender on students' achievement scores in Mathematics ($F_{(1,145)} = 1.893$, $P = 0.171$) This implies that the post-test mean achievement scores of male and female students exposed to the different instructional strategies are not significantly different. Therefore, the null hypothesis is not rejected.

Hypothesis three

There is no significant interaction effect of storytelling strategy and gender on students' academic achievement in Mathematics.

The results of the two-way interaction effect of instructional strategy (storytelling) and gender in table 1 shows that there is no significant interaction effect of instructional strategy and gender on the students' post-test achievement score in Mathematics $F_{(1,145)} = 2.562$; $P = 0.112$). This outcome implies that the

students post-test mean achievement scores in Mathematics under different instructional strategies (storytelling and conventional) do not vary significantly between male and female students. Hence, the null hypothesis is not rejected.

Table 2 Estimates of Control and Experimental Treatment

Estimates

Dependent Variable: post

Treatments	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Experimental	32.580[a]	.598	31.397	33.762
Control	25.333[a]	.789	23.773	26.894

a. Covariates appearing in the model are evaluated at the following values: pre = 14.6667.

The results in table 2, shows that participants in the experimental group had a mean score of 32.580 and standard error of 0.598 while those in the conventional strategy of teaching (control group) had a mean score of 25.333 and standard error of 0.789.

Table 3: Univariate test of the effects of conventional and storytelling strategy on students' achievement in Mathematics.

Univariate Tests

Dependent Variable: post

	Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Contrast	1615.727	1	1615.727	52.502	.000	.266
Error	4462.329	145	30.775			

The F tests the effect of treatments. This test is based on the linearly independent pair wise comparisons among the estimated marginal means.

The result in table 3 shows that there is significant effect of treatment on participants' academic achievement in Mathematics ($F_{1,145} = 52.502$; $P < 0.05$). Hence, the formulated null hypothesis one which states that there is no significant main effect of storytelling strategy on students' academic achievement in Mathematics is rejected in favour of the alternate hypothesis. This implies that there was significant differential effect of the treatment on participants' academic achievement in Mathematics. The implication of this finding is that while the two treatments were effective at improving achievement in Mathematics, they differ in terms of the strength of their effectiveness. Therefore, to determine the direction of the difference, pair-wise comparison was carried out. The results are shown in table 4

Table 4 Pair wise comparison of treatments on participants' achievement.

Pair wise Comparisons

Dependent Variable: post

(I) treatments	(J) treatments	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Experimental	Control	7.246*	1.000	.000	5.270	9.223
Control	experimental	-7.246*	1.000	.000	-9.223	-5.270

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Bonferroni.

Table 4 shows significant differences in the academic achievement improvement of participants exposed to experimental instructional teaching group (MD = 7.246; std error = 1.000; P < 0.05) and conventional instructional guide (MD = -7.246; std error = 1.000; P < 0.05). This implies that the treatments differ significantly in terms of their effectiveness on participants' academic achievement in Mathematics. The result is further illustrated in fig 1

Profile Plots

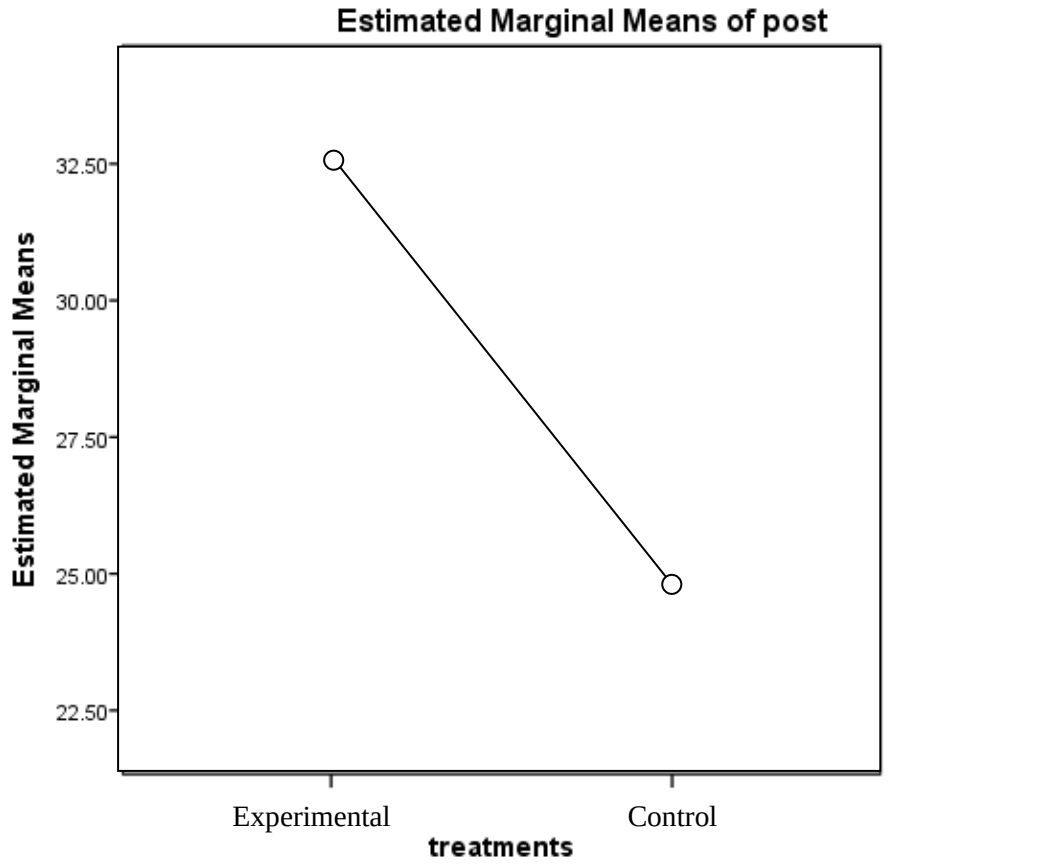

Figure 1 Estimated Marginal Means of Post-Test

Figure1 indicated that participants in the storytelling strategy procedural teaching guide (experimental group) had the higher mean score (32.580) while those in the conventional teaching method (control group) had the lower mean score (25.333). This implies that the experimental group was more effective at improving academic achievement in Mathematics.

DISCUSSION

The findings of the study revealed that there was significant main effect of storytelling strategy on students' academic achievement in Mathematics. It was also observed that both storytelling and conventional strategies brought about improvement in the students' achievement in Mathematics classroom after treatment though storytelling strategy brought about better achievement when compared with the conventional strategy. This finding confirms the assertion of Sadik, (2008) that storytelling is an effective way of engaging students in higher order thinking, which is helpful in fostering students' problem-solving competence. Although it was observed that both groups made learning gains, the students exposed to storytelling strategy recorded the highest mean score while the students exposed to conventional strategy recorded the least mean score. This finding agrees with Kariuki and Humphrey (2006) findings that reported a significant difference between the academic achievement of those taught using drama and the traditional instruction, they concluded that drama is an effective teaching tool. These findings showed that storytelling strategy had more superior potency in enhancing learning than the conventional strategy. This finding corroborates the assertion of Ozel & Ufektepe (2002) who discovered that using storytelling to teach Mathematics can increase students' interest and attentiveness during lessons which in turn can facilitate better internalization of concepts. Hung, Hwang & Huang (2012) buttressed the assertion that storytelling is effective in enhancing the students' achievement while Toor & Mgombelo (2015) attested to the fact that teacher's storytelling humanizes Mathematics in ways that engage both the 'being' and cognitive faculties of a student. This further affirmed Piaget's developmental theory which states that children process what they have been taught and what they are being taught in a story is assimilated by creating mental images.

Furthermore, the findings of the study revealed that there no was significant main effect of gender on students' academic achievement in Mathematics. These results support the findings of Lawani 2021; Lawani 2021; and Lawani et al 2016 all established that gender difference does not influence students' academic performance in Mathematics.

Lastly, the findings of the study revealed that there is no significant interaction effect of storytelling strategy and gender on students' academic achievement in Mathematics. This outcome implies that achievement of students exposed to Mathematics using storytelling and conventional strategies did not vary significantly between male and female students. Also as a single factor, gender did not contribute significantly to the difference in achievement of subjects. This implies that the effectiveness of storytelling as a strategy has got nothing to do with gender of students and that no treatment was particularly superior over the other for any of the gender groups.

CONCLUSION

The impact of storytelling has been proven to be efficacious in the teaching of previously thought-to-be-difficult mathematical concepts. As seen in this study, the use of stories and tales helped in the achievement of Junior Secondary School students in Ijebu Ode Local Government Area as against the conventional methods of teaching the subject and topics. Given the above findings, it could be concluded that the use of stories in Mathematics classes should be encouraged for Junior Secondary School students in Ijebu Ode Local Government Area and beyond.

RECOMMENDATIONS

The results of this study indicated that storytelling strategy brought about improvement in students' achievement in Mathematics classroom after its usage. This implies that this strategy is effective and can be recommended for use in the teaching and learning of Mathematics. Based on this finding, the following recommendations are made:

Storytelling strategy is capable of improving students' achievement in Mathematics because it enhances retention. It is thus suggested that storytelling strategy should be used alongside conventional strategy in the teaching and learning of Mathematics in our primary and secondary schools since the instructional strategy proved to be effective and brought about improvement in students' achievement in Mathematics.

Mathematics teachers should be trained to adopt storytelling strategy in Mathematics classrooms in order to enhance students' academic achievement. Curriculum designers, stakeholders of education and heads of schools should encourage and support the use of storytelling strategy as an instructional strategy in schools at all levels. Special workshops, in-service training and seminars should be organized for teachers so as to equip them with necessary skills required for developing and telling of good educational stories so as to enhance achievement in Mathematics.

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